INTERLOCKING MODULES FOR RAPID CONSTRUCTION OF SHELTERS AND BARRIERS

Inventor: Clarence E. Parker, 6235 Kearney St., Ventura, Calif. 93003

Filed: July 23, 1973

Appl. No.: 381,468

U.S. Cl. 52/262, 52/271, 52/309, 52/492, 52/589, 46/30

Int. Cl. E04b 2/18

Field of Search 52/262, 270, 284, 576, 52/589, 169, 668, 489, 426, 429, 425, 592; 46/21, 30; 61/29, 32

References Cited

UNITED STATES PATENTS

1,240,492 9/1917 Sawyer 52/425
2,209,564 7/1940 Grubb 52/589 X
2,832,100 4/1958 Swallert 46/21
3,066,436 12/1962 Schuh 46/30
3,080,674 3/1963 Amici 52/592 X
3,143,236 8/1964 Haas 46/21 UX
3,149,437 9/1964 Wheeler-Nicholson 52/439
3,304,674 2/1967 Ward 52/425 X
3,427,771 2/1969 Cacossa 52/262
3,553,919 1/1971 Ombolt 52/492
3,751,867 8/1973 Layne 52/426

This is a modular construction system for rapid assembly and disassembly of shelters and barriers which provides protection from natural or man-made environments. The shelters are constructed from three types of modules which permit a wide variety of covered structures or walls which may be quickly erected to protect occupants and equipment. The three modules are end panels or spacers which are slotted, side wall or roof panels which have asymmetric slots on either end and a groove along one edge and a rectangular roof beam having vertical hook-like connectors spaced along the outside wall of the beam. When the spacers are interlocked with two of the side wall panels, a cavity is formed which can be filled with sand to provide a more rigid and solid shelter. For overhead cover, two or more beams span the walls and the panels interlock with the hook-like connectors along the outside of the beams to form the roof. The panels interlock horizontally by the grooves and overlap at the hook. Sand or sandbags can be piled on the roof to give additional protection.

10 Claims, 7 Drawing Figures
INTERLOCKING MODULES FOR RAPID CONSTRUCTION OF SHELTERS AND BARRIERS

BACKGROUND OF THE INVENTION

This invention relates to temporary shelters and more particularly relates to shelters used as fortification for combat use.

Shelter is a basic need of man. Throughout history great effort has been made to devise shelter from the natural environment. Also, fortifications for combat use have occupied military engineers throughout the history of warfare. Despite this, the current military field shelter is bagged earth, either with or without simple wood frame structural support. Such shelters require great physical effort to build, skilled labor for framing, and must be abandoned or demolished after use. In the case of mobile warfare, the shelter or barrier is needed for a short time (days or weeks), and the assembly/disassembly should be correspondingly rapid (minutes or hours). Likewise, such a shelter/barrier should be capable of assembly by unskilled personnel and should impose a minimum shipping burden.

As indicated above, sandbagging has been the standard field fortification method during the past century. Empty bags are filled in the field by troops using shovels. Full sandbags are heavy and clumsy. They take a lot of labor for filling and proper implantation. They must be carefully aligned, pounded flat, and cross-stacked for stability. They expose combat troops to enemy fire while being put in place. They deteriorate with time, need replacement when hit, and are not reusable.

To solve the above problems, a new field fortification system was developed which provides shelter by assembling three simple modules which do not require skilled labor for their assembly. The modules for constructing the field fortification shelter make use of fiberglass/plastic woven roving, armor material. These plastic modules are light in weight, easily handled and very durable. The three module types interlock and need no bolts or other connectors. This minimal number of parts permit rapid field construction of double-walled structures whose walls are then filled with dirt for maximum protection. A roof structure supported on hollow fiberglass beams is provided for and can be covered with a foot of earth for enhanced blast and fragment protection. The entire assembly can be quickly dismantled, stowed for transport, and moved out of the area, eliminating the necessity of demolishing field fortification to deny enemy use.

SUMMARY OF THE INVENTION

The purpose of this invention is to provide a protective shelter which can be quickly assembled or disassembled. Interlocking modules permit rapid construction of a wall structure with a cavity which can be filled with dirt to provide protection from ballistic-type weapons. A roof structure comprised of hollow, rectangular beams which are spanned by interlocking panels provide overhead protection. A sand covering on the roof provides additional protection, if desired.

OBJECTS OF THE INVENTION

It is one object of the present invention to provide a high strength protective shelter.

Another object of the present invention is to provide a high strength protective shelter which may be rapidly assembled or disassembled.

Yet another object of the present invention is to provide a high strength protective shelter which may be readily assembled by unskilled laborers.

Still another object of the present invention is to provide a high strength protective shelter which may be constructed of a minimum number of parts.

Yet another object of the present invention is to provide a high strength protective shelter constructed of modules easily assembled in the field which are light in weight, easily handled and very durable.

Still another object of the invention is to provide a high strength protective shelter constructed of modules which interlock and need no bolts or other connectors.

Other objects, advantages and novel features of the invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a high strength protective shelter constructed of the interlocking modules.

FIG. 2 is a drawing of a module which is used for the side or roof panels having asymmetric slots on either end and a groove formed along one edge.

FIG. 3 is a drawing of a module having slots used for a spacer or an end panel.

FIG. 4 is a drawing of a roof beam having a plurality of hook-like connectors attached along one side at a predetermined spacing.

FIG. 5 illustrates the interlocking of four spacer panels to form a corner.

FIG. 6 shows spacer panels interlocked with side wall panels to form a fillable box unit.

FIG. 7 illustrates the manner in which side panels are interlocked with the hook-like connectors attached to the beams to form a roof.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown a high strength protective shelter 10 constructed of the interlocking modules shown in FIGS. 2, 3 and 4. Four spacers are interlocked to form the corner 12, as shown in FIG. 5. The side walls 14 are formed of spacers 16 interlocked with side wall panels 18. The spacers 16, when interlocked with the side wall panels 18, provide a cavity which can be filled with sand to provide a sturdy side wall construction. Side wall panels 18 can be interlocked with the spacer panels 16 such that they overlap on their ends, as shown at 20, to provide any length side wall construction design desired. FIG. 1 shows two side wall panels 18 interlocked with a spacer 16. The height of the shelter is controlled by the number of side wall panels 18 which are stacked one on top of another after being interlocked with the spacer panels 16. The grooves 22 on the lower edge of the side wall panels interlocks with the side wall panel beneath it as shown at 24. In FIG. 1, the side wall panels are shown stacked three high. However, any number of side wall panels can be added to provide a shelter of any height desired.

The roof 26 of the structure is constructed by laying beams 28 across the walls 14 of the structure and then...
using the side wall panels 18 to provide the roof. The side wall panels are interlocked with the beams, as shown at 30 in FIG. 7, with the groove 22 on the lower edge or one edge of the side wall panels 18, engaging the edge of the adjacent panel. If the roof 26 requires more than two beams 28, they are spaced to permit overlapping of the ends of the panels at the hook-like connectors 32. In FIG. 1, the roof is formed of four beams 28 with three interlocking panels 18, in series, overlapping each other at the hook-like connectors 32 of the two center beams. Due to the high strength of the panel connectors and the beams, additional overhead protection can be provided by covering the top of the shelter 10 with sand.

The standard modular side wall and roof panel 18 is shown in detail in FIG. 2. The side panel 18 has elongated slots 34 near each end of the panel. The slots 34 are slightly longer than half the width of the panel 18. At the top edge of the panel 18, parallel with the long slots 34, are short slots 36 which may be any desired length. The purpose of the short slots 36 is to engage a rearward projection 38 (FIG. 4) of the hook-like connector 32 on the beam 28 to prevent lateral movement of these panels when they are used to form the roof. Along the edge adjacent to the long slots 34, two strips 40 are attached to the panel 18 on either side to form a groove 22. The groove should be deep enough to provide a relatively rigid construction when it is engaged with an adjacent panel. The strips 40 forming the groove are cemented and also can be bolted in place. The slots 34 are slightly wider than twice the thickness of the material used for the side panels 18 and the spacer 16 to permit overlapping.

The spacer panel 16 is shown in detail in FIG. 3. Slots 42, adjacent each end of the spacer panel, correspond with the long slots 34 in the side panel 18. The vertical height and slot length of the spacer 16 is identical with the vertical height and slot length of the side panel 18, as shown in FIG. 6. The horizontal width of the spacer 16 can be varied, depending upon the thickness desired when the shelter is constructed. That is, the horizontal width and slot placement in the spacer 16 determine the cavity size when the spacers 16 and the side wall panels 18 are interlocked.

The roof beam 28 is shown in detail in FIG. 4. The beam portion is comprised of square or rectangular, hollow, fiberglass tubing which has a plurality of evenly spaced, hook-like connectors 32 fastened along one side. The hook-like connectors 32 are spaced such that the side panels 18, when interlocked with the beams 28, abut each other with the groove 22 overlapping the adjacent side panel 18, as shown in FIG. 1. A rearward projection 38 on the hook-like connectors 32 match the short slot 36 of the side panels 18 to align and prevent lateral movement of the side panels 18 when they are assembled with the beam 28 to form a roof 26. If a protective shelter 10 is to be constructed with a roof 26, then the length of the side walls 14 will be limited by the length of the roof beam 28. Various lengths of roof beams 28 are possible; however, the preferred embodiment use roof beams 28 of approximately 10 feet. This length equals two corner units 12 and two side panels 18, in series, all interlocked. The beams 28 can be made in a variety of lengths to accommodate shelters of varying shapes.

The corner unit 12 is formed by four interlocking spacers 16 as shown in FIG. 5. The side wall panels 18 are interlocked with spacer panels 16 to form a fillable box unit as shown in FIG. 6. One of the spacers 16 of the corner unit 12 interlocks one end of the two side wall panels 18 to connect the two together. The side wall 14 is constructed by connecting additional side wall panels 18 together so that they overlap and are held together by a spacer 16 as shown in FIG. 1. The length of the side wall 14 is determined by the number of side wall units interlocked by spacers 16. In FIG. 1, the side wall 14 is constructed of two side wall panels 18, in series, interlocked with a spacer 16 with the opposite ends each interlocked with a corner unit 12. The height of the shelter is determined by stacking the side wall units on top of each other with the groove 22 interlocking the side panels 18 of the side wall unit below it.

The roof 26 is constructed as shown in FIG. 7. Beams 28 are layed across the top of the side wall units, as shown in FIG. 1, and the side wall panels 18 are interlocked with the hooks 32 so that the groove 22 engages the adjacent side wall panel 18. Prior to assembling the roof 26, the cavities in the side wall and corner units may be filled with the sand or any other suitable material. For protection from ballistic weapons, the side walls were filled with sand and packed as each side wall unit was stacked on top of another. The width of the shelter 10 in FIG. 1 is equal to the length of the roof beams 28. Side wall panels 18, when used to form the roof 26 of shelter 10, overlap when interlocked with the same beam 28. For additional overhead protection, sand or dirt may be piled on top of the roof 26.

A number of materials are suitable for fabricating the side wall panels 18, spacer panels 16 and roof beams 28, such as mild steel, aluminum, plywood or fiberglass. In the preferred embodiment, the panels and roof beams were made of a fiberglass/plastic woven roving armor material. This material was selected because it is extremely durable, light in weight, and is high in strength.

Since the primary application is for ballistic and environmental protection of military forces and their equipment and mobile operations on land, a ballistic, projectile-resistant, panel material of bonded, woven roving fiberglass is preferred. Alternative applications may include temporary shelters in remote areas (for example, construction personnel housing) could utilize a lightweight structural material such as plastic, honeycomb or foam-filled sandwich composites. Where low cost is most important, exterior plywood, suitably painted, could be a material. Where transparency is desired as in window sections, an acrylic plastic or, in the ballistic application, a polycarbonate plastic is desirable. In extreme environments where thermal insulation is required, a foam-in-place method could be used to fill the wall cavities, using a polyurethane two-component mix. The modules can be scaled up or down in size with selection depending upon ease in handling for manual assembly and efficient palletizing for shipment. While the drawings show fabrication of the modules from flat material stock, in production, slots and grooves could readily be molded by plastic manufacturing procedures. Molded-in metal reinforcement of slots and extruded metal grooves are a potential production refinement.

Thus, there has been disclosed a high strength protective shelter constructed of easy to assemble modules for rapid assembly by unskilled labor and capable of disassembly for reuse.
Obviously many modifications and variations of the present invention as possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A protective shelter constructed from interlocking modules comprising:
   a fillable wall structure comprised of:
   a plurality of fillable, rectangular box units connected in series horizontally and stacked and interlocked vertically; said fillable box units comprised of spaced apart, side wall panels having asymmetric slots on each end and a groove along a portion of one edge, interlocked with spacer panels having asymmetric slots engaging the asymmetric slots of the side wall panel; vertical interlocking being provided by the edge of one side panel being engaged with the groove of the vertically adjacent side panel and horizontal, in series, connection being provided by overlapping horizontally adjacent side panels and interlocking the asymmetric slots of each with a spacer panel;
   a plurality of fillable, square corner units interlocked horizontally at the outermost opposite ends of the series connected fillable, rectangular box units; said corner units being comprised of four interlocked spacer panels; horizontal interlocking being provided by overlapping two of the spacer panels of the corner unit with the ends of the horizontally adjacent side wall panels and interlocking the asymmetric slots of each with a spacer panel; a roof structure comprised of:
   a plurality of parallel spaced box beams, spanning the wall structure, having a plurality of equally spaced, vertical hook-like connectors and a plurality of side wall panels lying between the box beams with the asymmetric slots engaging the hook-like connectors and the groove of one panel engaging the edge adjacent panel.

2. The protective shelter as recited in claim 1 wherein the hook-like connectors on the box beams have a rearward projection and the side panels have short slots on the opposite side, parallel and in line with the asymmetric slots; said short slots engaging the rearward projection of the hook-like projection for aligning the panels to form the roof structure.

3. The protective shelter as recited in claim 2 wherein the fillable wall structure is filled with sand.

4. The protective shelter of claim 3 wherein the side panels and spacer panels are comprised of fiberglass/plastic woven roving material.

5. The protective shelter of claim 4 wherein the box beam is comprised of rectangular, hollow, fiberglass tubing having fiberglass hook-like connectors attached along one side.

6. The protective shelter of claim 5 wherein the side panel grooves are formed by attaching strips of fiberglass/plastic woven roving material along one edge of the panels between the asymmetric slots.

7. The protective shelter of claim 6 wherein the slots in the side panels and spacer panels are slightly wider than twice the thickness of the panels whereby the panels overlap when interlocked with a spacer.

8. The protective shelter of claim 7 wherein the slots are reinforced with metal.

9. The protective shelter of claim 2 wherein the fillable wall structure is filled with a foamed-in-place polyurethane mix.

10. The protective shelter of claim 9 wherein the side panels and spacer panels are comprised of plywood.

* * * *